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MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO) 24 July 2001

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2001-168**
C.T. Liu and J. Gonzalez (Clinical Micro Sensors), "Hybrid Experimental-Numerical J-Integral Analysis and Crack Growth Resistance of a Particulate Composite Material (Keynote Lecture)"

International Conf. on Computational Science and Engineering **(Statement A)**
(Puerto Vallarta, Mexico, 20-24 August 2001) (Deadline: 14 Aug 2001)

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PHILIP A. KESSEL Date
Technical Advisor
Space and Missile Propulsion Division

HYBRID EXPERIMENTAL-NUMERICAL J-INTEGRAL ANALYSIS AND CRACK GROWTH RESISTANCE OF A PARTICULATE COMPOSITE MATERIAL

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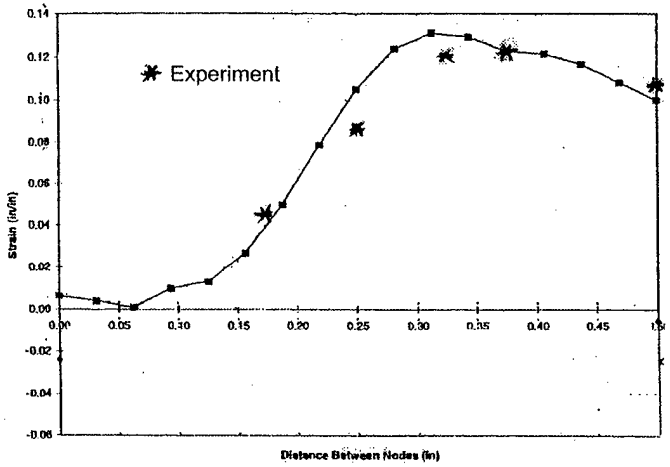
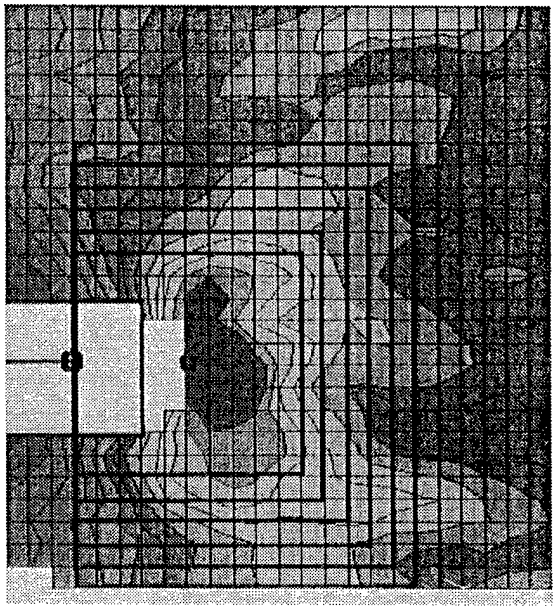
Objectives

- Investigate the Inhomogeneous Nature of the Microstructure.
- Determine J-Integral Using a Hybrid Experimental-Numerical Technique.
- Investigate Crack Growth Behavior.

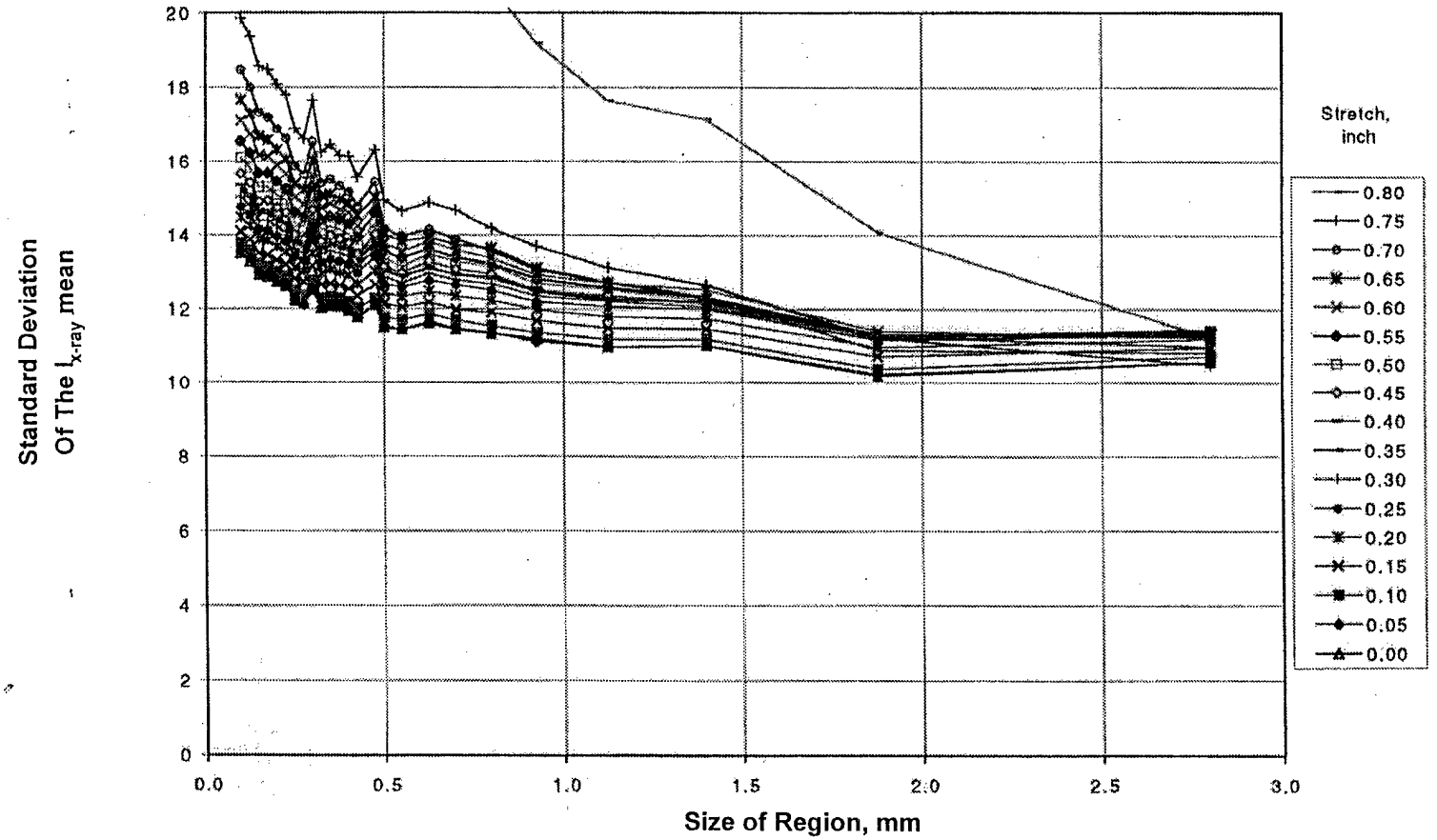


Normal Strain Along an Integration Path

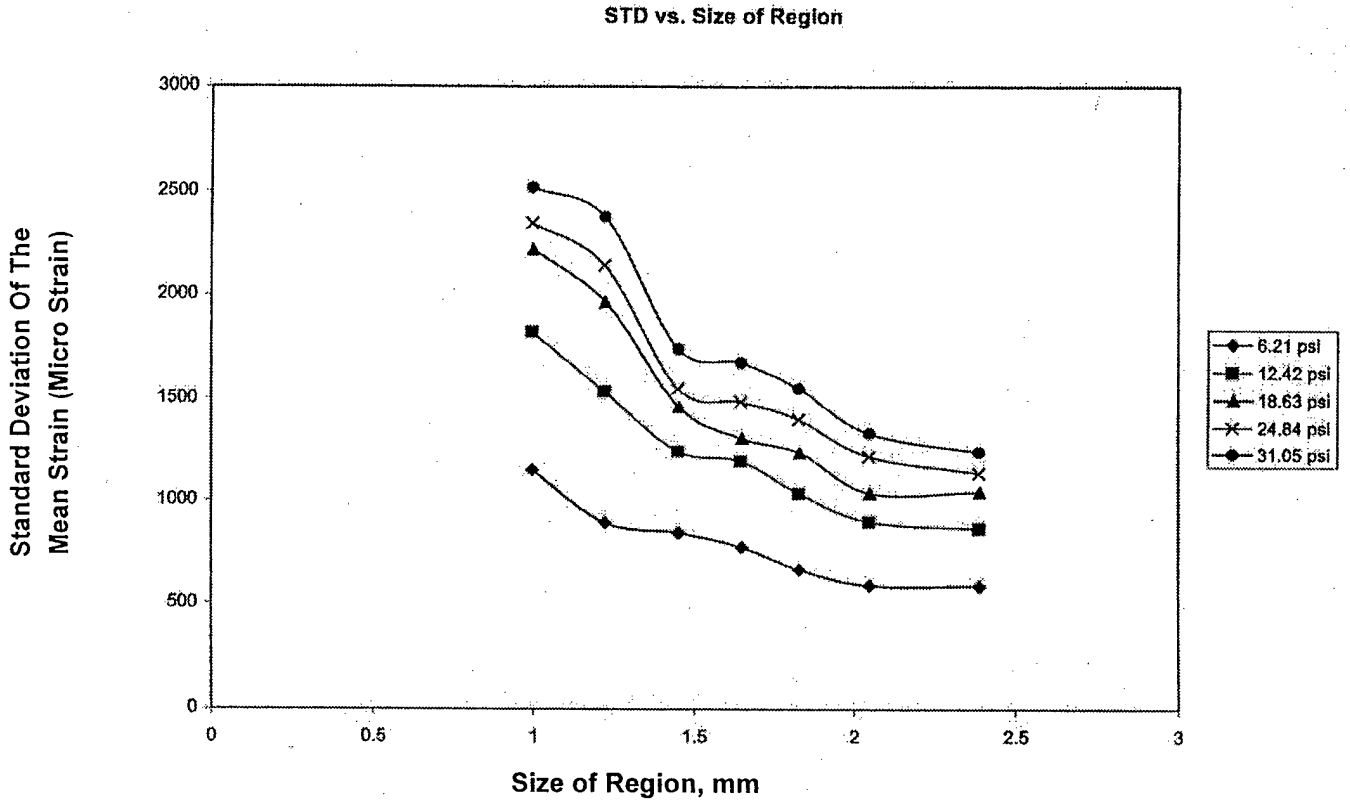


Strain Distributions and Integration Paths

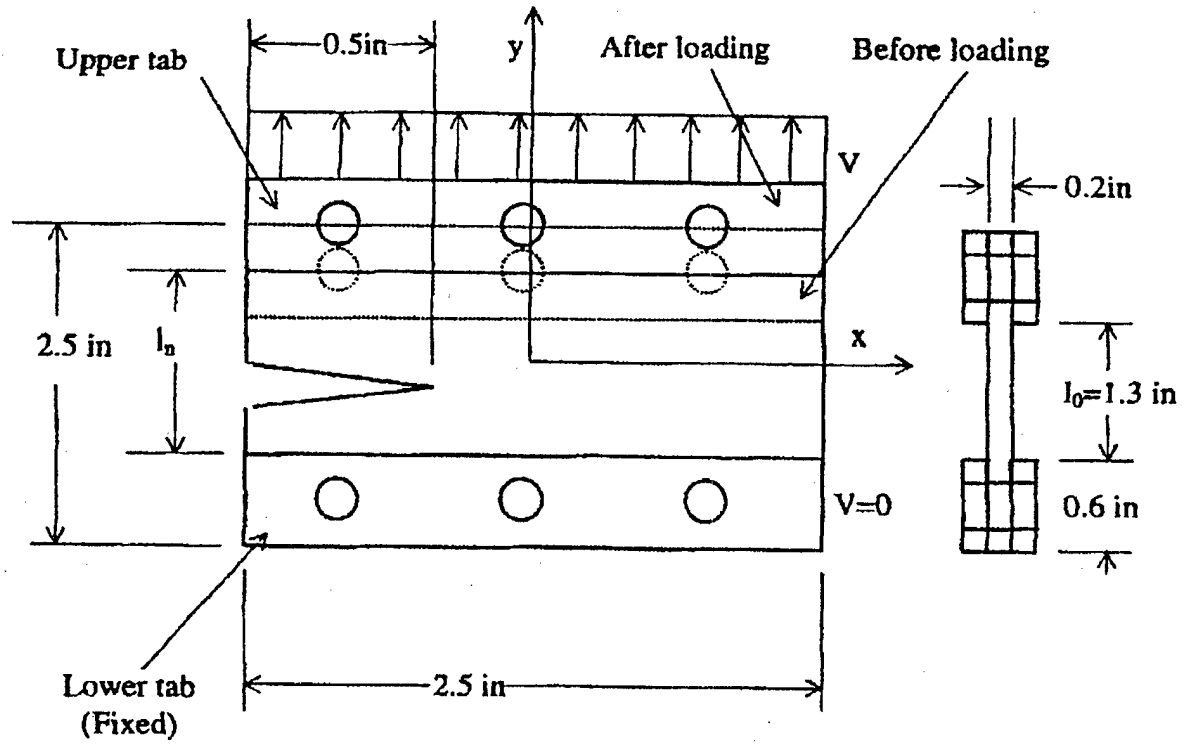
Standard Deviation of X-Ray Intensity Versus Size of Region as a Function of Applied Deformation



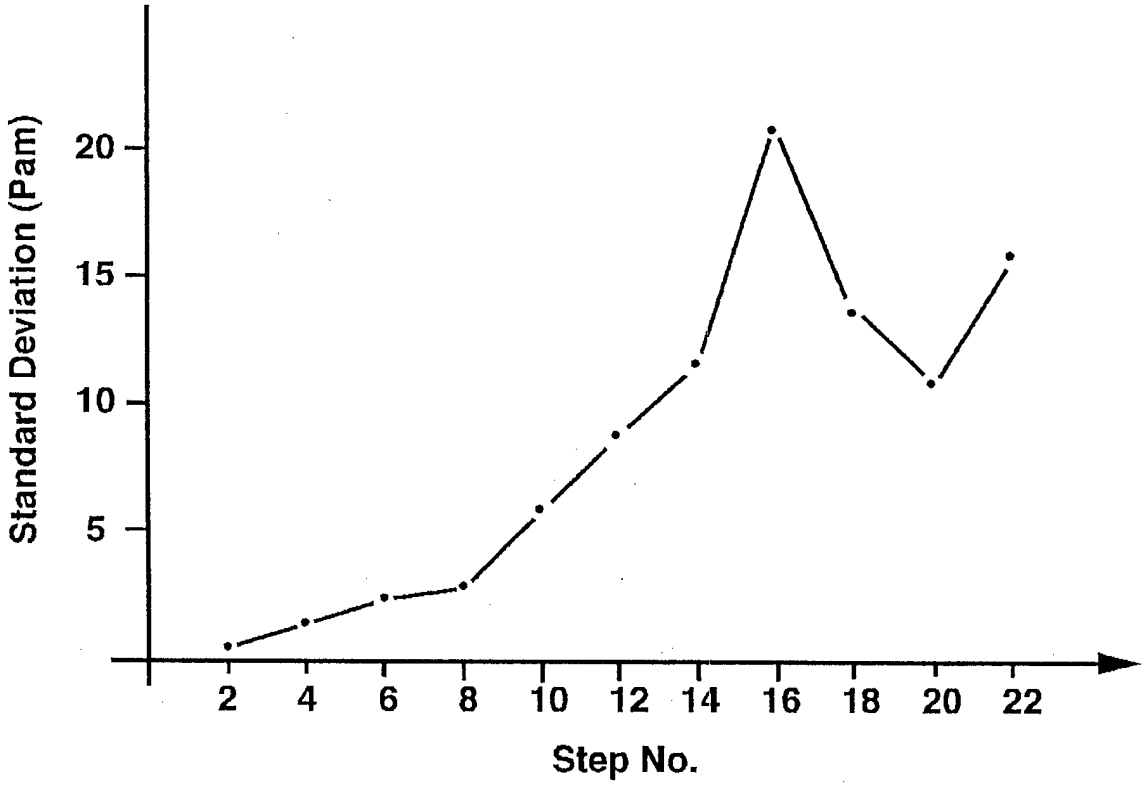
Standard Deviation of Strain Versus Size of Region as a Function of Applied Stress



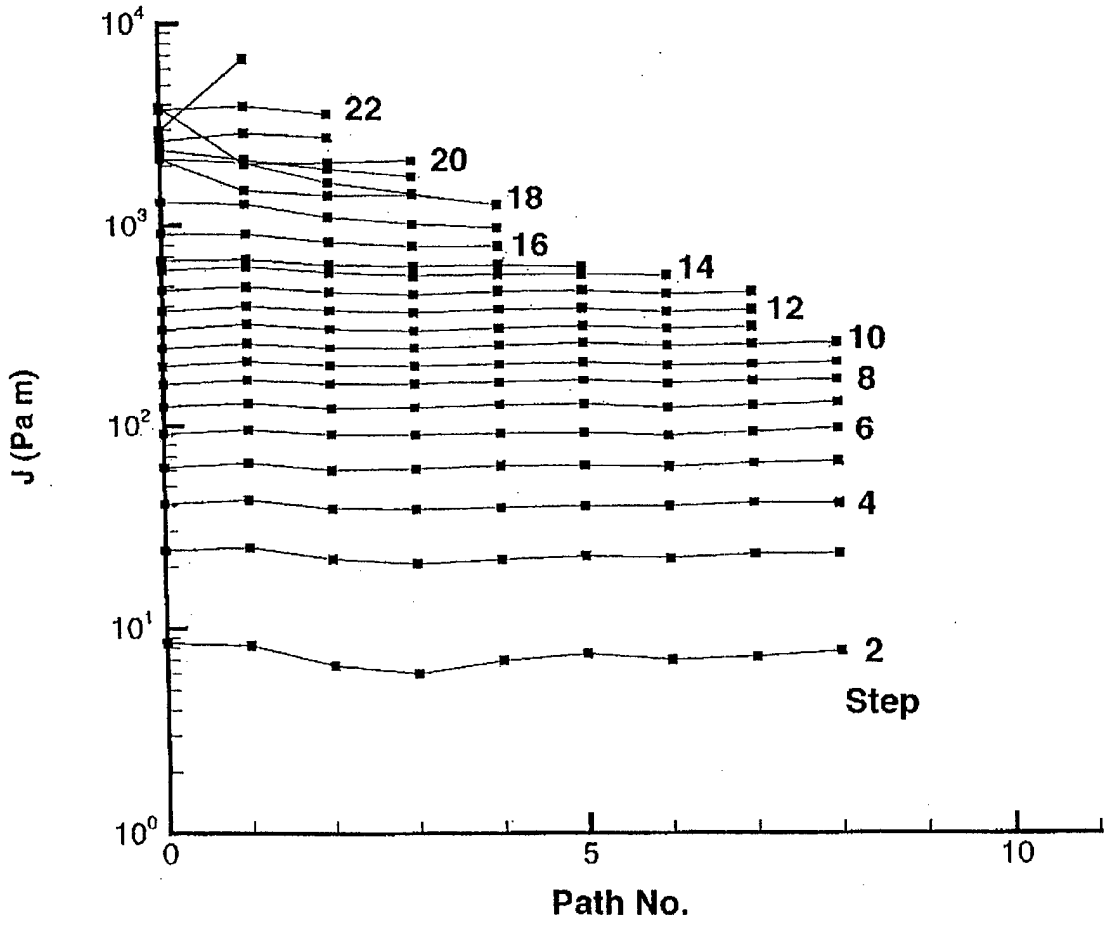
Specimen Geometry



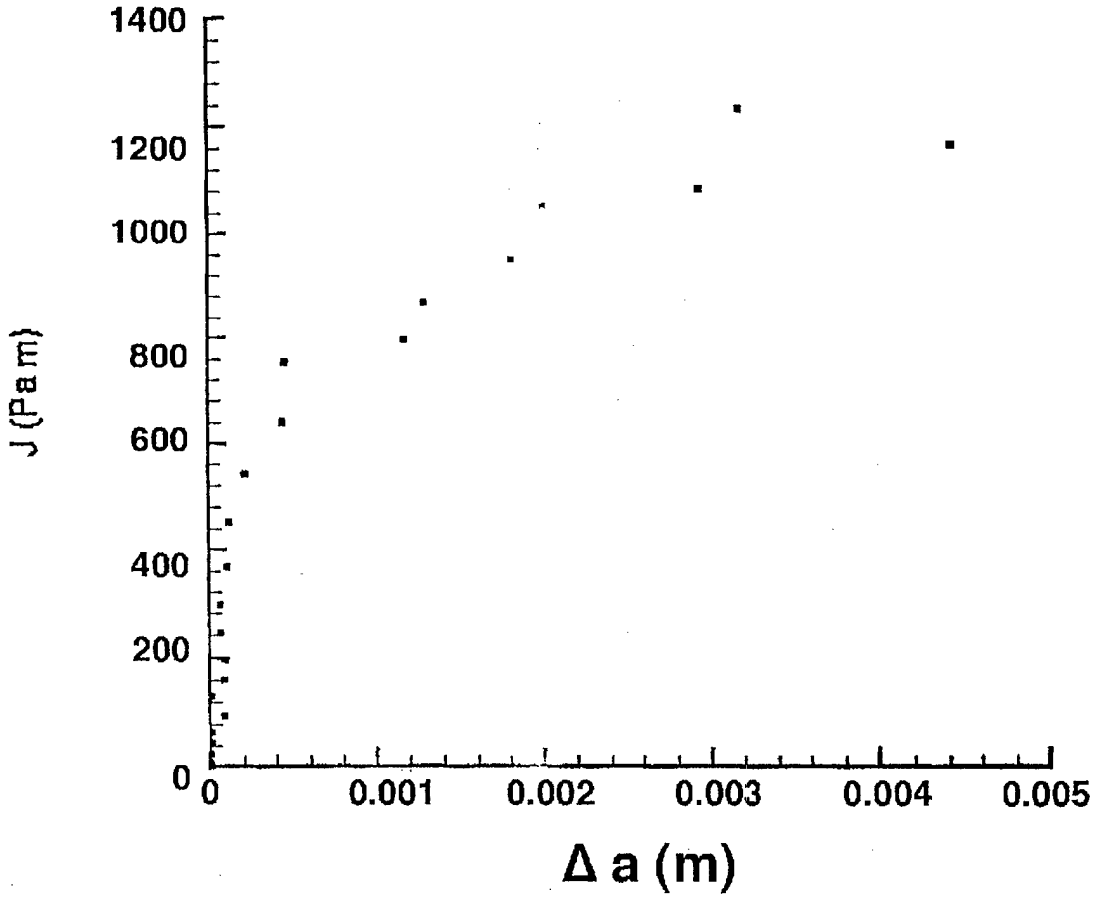
Standard Deviation of J-Integral Versus Step Number (Applied Strain)



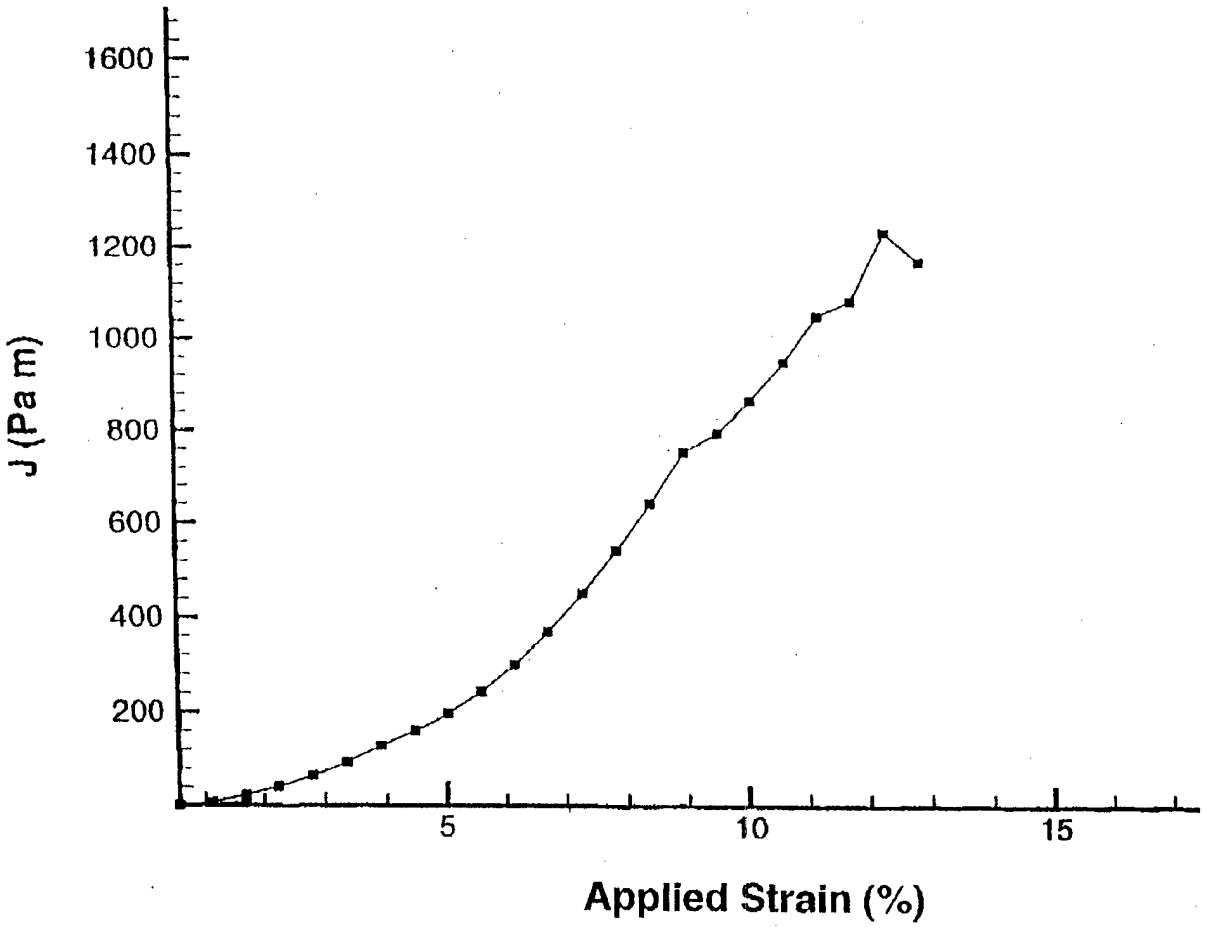
J-Integral Versus Path Number as a Function of Step Number (Applied Strain)



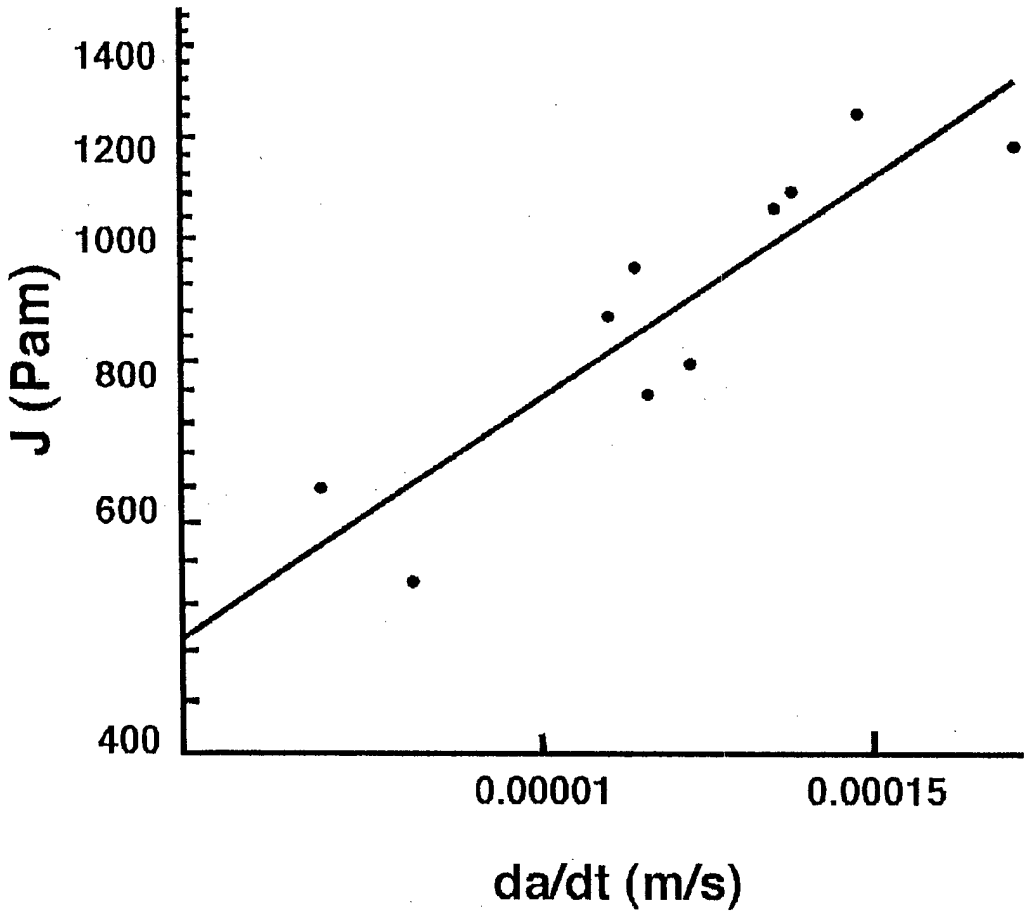
Crack Growth Resistance Curve

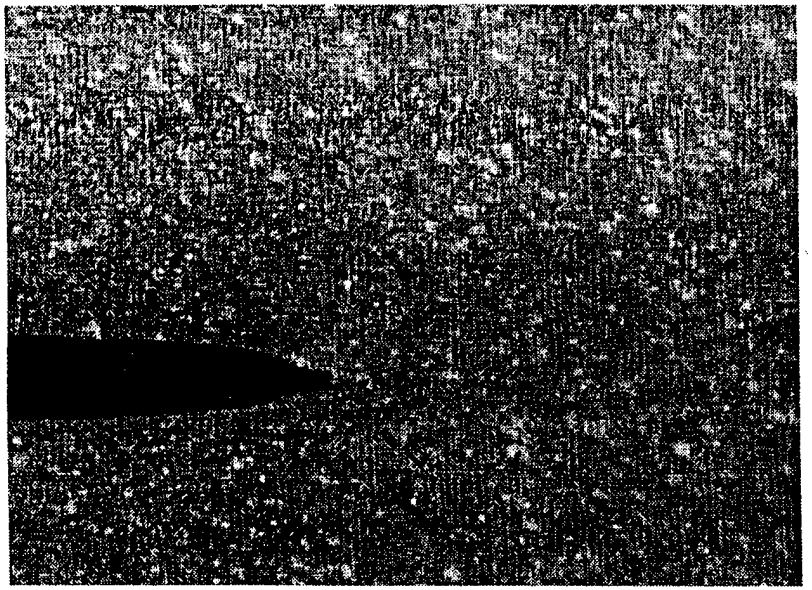


J-Integral Versus Applied Strain



Crack Growth Rate Versus J-Integral





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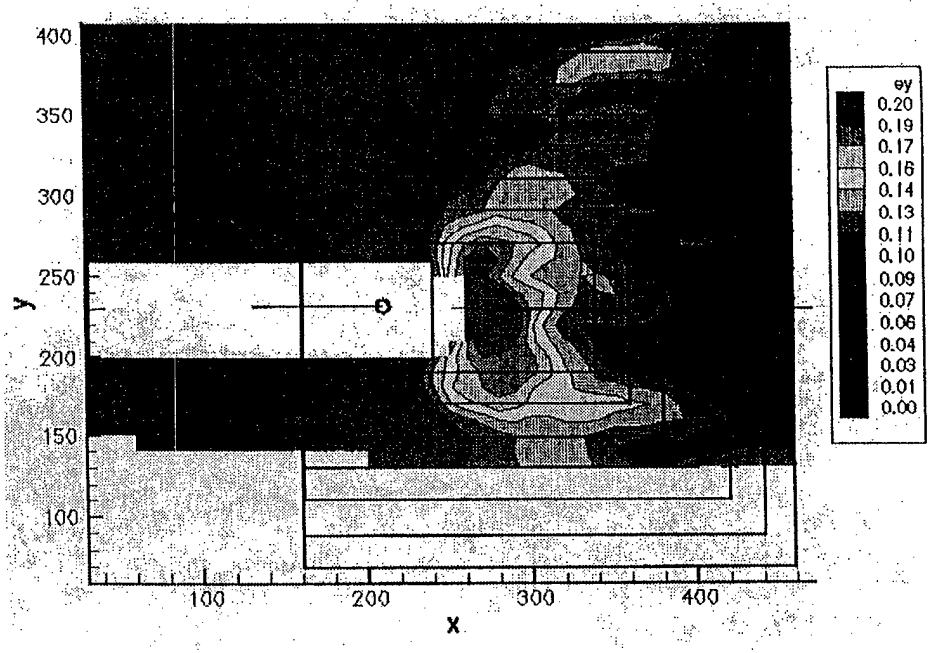

Strain Distributions and Integration Paths

Conclusions

- The minimum area for a valid homogeneous continuum assumption of the particulate composite material is 2 mm x 2 mm.
- On the macroscopic scale, the J-Integral is independent of the integration path.
- A power law relationship exists between the J-Integral and the crack growth rate.